Natural Gas Flip-Flop

Big environmental groups were for fracking before they were against it.

THE WORLD'S projected natural gas supplies jumped 40 percent last year. Until a decade ago, experts believed it would be technically infeasible to exploit the natural gas locked in 48 shale basins in 32 countries around the world. Then horizontal drilling, combined with hydraulic fracturing, also known as fracking, was introduced. The shale gas rush was on, and last year the U.S. Energy Information Administration (EIA) dramatically raised its estimate of available natural gas.

The ability to produce clean-burning natural gas from shale could transform the global energy economy. Right now we burn about 7 trillion cubic feet (TCF) of natural gas to generate about 24 percent of the electricity used in the United States. The U.S. burns a total of 23 TCF annually to heat homes and supply industrial processes as well as produce electricity. Burning coal still produces about 45 percent of U.S. electricity.

A rough calculation suggests that 100 percent of coal-powered electricity generation could be replaced by burning an additional 14 TCF of natural gas, boosting overall consumption to 37 TCF per year. The EIA estimates total U.S. natural gas reserves at 2,543 TCF, which suggests that the U.S. has enough natural gas to last about 70 years if it entirely replaced the current level of coal-powered electricity generation.

Similarly, it should be possible to replace all current U.S. gasoline consumption with about 17 TCF of natural gas per year. So replacing coal and gasoline immediately would require burning 54 TCF annually, implying a nearly 50-year supply of natural gas. And replacing dirtier coal and gasoline with natural gas would reduce overall U.S. carbon dioxide emissions by about 25 percent.

The national green lobbies initially welcomed shale gas. In 2009, for example, Robert Kennedy Jr., head of the Waterkeeper Alliance, called it "an obvious bridge fuel to the 'new' energy economy." Local environmental activists were not as enthusiastic, arguing that fracking contaminates drinking water and causes other forms of pollution. After a while, some of the national lobbies began to come around to the locals' side. In the words of the journalist Matt Ridley, "it became apparent that shale gas was a competitive threat to renewable energy." Josh Fox, director of the anti–natural gas documentary *Gasland*, put it bluntly on Kennedy's radio show: "What's really happening here is not a battle between natural gas and coal. What's happening here is a battle between another dirty fossil fuel and renewable energy."

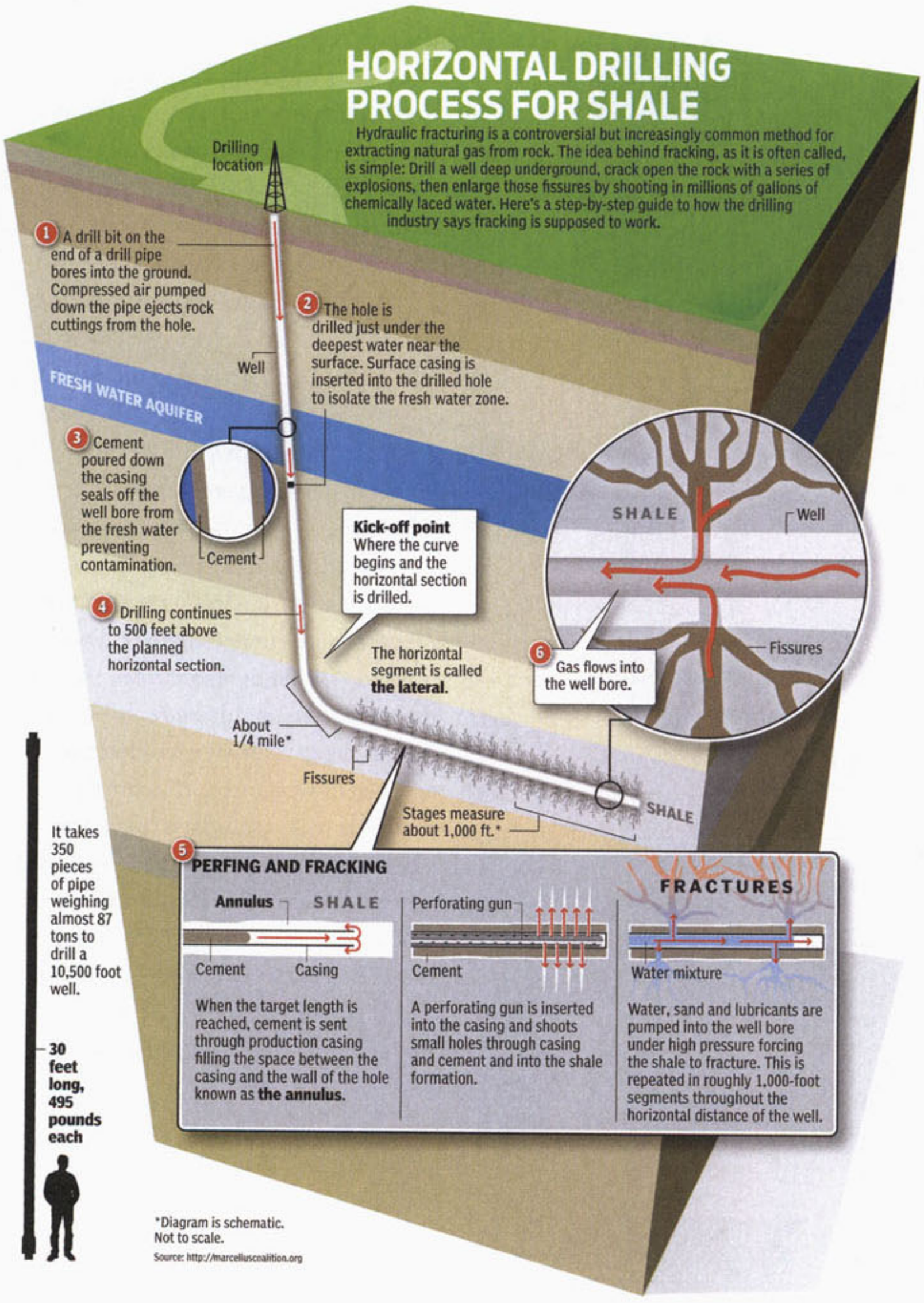
Indeed, natural gas is cheaper than renewable sources of energy, even if you include the costs of carbon capture and sequestration. The EIA's *Annual Energy Outlook* for 2011 calculates the levelized costs of electric power generation for various fuel sources. (Levelized costs include all capital, operating and maintenance, fuel, and transmission costs for building plants now that would switch on by 2016.) Electricity produced using natural gas in a combined cycle generating plant comes in at $66 per megawatt-hour. By contrast, offshore wind clocks in at $243 per megawatt-hour, photovoltaic at $211, solar thermal at $312, geothermal at $102, and biomass at $113. The only renewable sources that are close to competitive with natural gas are onshore wind at $97 per megawatt-hour and hydroelectric at $86.

Ridley cites five claims against fracking: Fracking fluids contain dangerous chemicals that might contaminate groundwater; wells allow

gas to escape into aquifers; well wastewater is contaminated with salt and radioactive elements that pollute streams; fracking uses too much fresh water; and drilling damages landscapes.

The shale that contains natural gas lies below thousands of feet of impermeable rock, so the fracking process itself will not contaminate drinking water aquifers, which generally are only a few hundred feet below the surface at most. A 2010 Pennsylvania Department of Environmental Protection report noted that, according to the Pennsylvania Bureau of Watershed Management, "no groundwater pollution or disruption of underground sources of drinking water have been attributed to hydraulic fracturing of deep gas formations."

As with conventional wells, it is possible that natural gas can escape into aquifers if the wells are not properly sealed using steel and cement casings. An April study in the *Proceedings of the National Academy of Sciences* found elevated levels of natural gas in groundwater wells within 3,000 feet of active gas well sites. The researchers concluded that the source is likely leaky casings. More reassuringly, the study "found no evidence for contamination of the shallow [water] wells near active drilling sites from deep brines and/or fracturing fluids." In any case, should their findings stand up to subsequent research, the problem is not fracking but improperly sealed well casings.



What about radioactive contamination of streams by well wastewater? The Pennsylvania Department of Environmental Protection announced that after checking samples taken downstream from the wastewater plants that had treated gas well water, it found that "all samples were at or below background levels of radioactivity; and all samples showed levels below the federal drinking water standard for Radium 226 and 228."

As far as using too much fresh water is concerned, Ridley points out that gas drilling in Pennsylvania uses about 60 million gallons per day, which compares to 1,550 million gallons used by public water systems. Ridley also notes that each well site takes up about six acres to extract gas beneath 1,000 acres, which is largely left alone once a well begins producing.

There's another argument against fracking. In the April issue of *Climatic Change*, a team of researchers led by the Cornell ecologist Robert Howarth suggested that the greenhouse gas emissions released by natural gas production are worse than those produced by burning coal. Natural gas is methane, which on a molecule

per molecule basis has a much greater ability to trap heat from the sun than carbon dioxide does. Howarth claims that methane leaking from natural gas wells contributes so much to global warming that the benefits of substituting it for coal are overwhelmed.

There are a number of problems with this study. Climatologists generally consider the effect of methane over a 100-year period, for example, but Howarth used a 20-year period, a change that automatically quadruples methane's warming effect. And now the Department of Energy's National Energy Technology Laboratory has done a life cycle analysis of gas versus coal. The lab concluded that "average natural gas baseload power generation has a life cycle global warming potential 50 percent lower than average coal baseload power generation on a 20-year time horizon." So even accepting Howarth's two-decade horizon, natural gas is much better than coal.

No industrial process is completely benign, and all have environmental consequences. The relevant question is: Do the benefits outweigh the costs? Are people better off using the resource than they would otherwise be? Of course, any company that damages some else's property should be fully liable for the costs. But if you're worried about man-made global warming, natural gas remains the affordable way to supply lower-carbon energy to the world as technologists work to bring renewable energy costs down. r

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